OSC029- Full-Year Sequence of Anatomy and Physiology I & II with Lab *(updated on 5.4.2021)*

Credit Hours: 8-10

Pre-Requisite: High School Chemistry or Biology or equivalent or background in science necessary as determined by institution

Lab Requirement: 2-3 lab hours per week (Note: Lab hours can include pre-lab and in-lab work to meet the 2-3-hour lab requirements per week. A minimum of 1.7 hours must be in-lab).

General Course Description:

This full-year sequence (two semesters of coursework) is designed to develop knowledge of fundamental principles and concepts of anatomy and physiology. Students will understand topics including but not limited to: Body Plan & Organization, Homeostasis, Chemistry & Cell Biology, Histology, Integumentary System, Skeletal System & Articulations, Muscular System, Nervous System, General & Special Senses, Endocrine System, Cardiovascular System, Lymphatic system & Immunity, Respiratory System, Digestive System, Nutrients & Metabolism, Urinary System, Fluid/Electrolytes & Acid-Base Balance, Reproductive System, Introduction to Heredity, and Embryology. With a range of anatomy and physiology sequences across the state, a year-long sequence will provide structure however, allow institutions to determine autonomy in lecture. Student learning is aligned with the core concepts and competencies which have been identified as foundational for undergraduate anatomy and physiology literacy by the Human Anatomy and Physiology Society (HAPS).

For a match to be approved for OSC029 – Anatomy and Physiology I & II (Full-Year Sequence), all of the following must be met:

1) Core Competencies marked with an asterisk (*) are required.
2) A minimum of 70% of each required Core Competencies' sub-categories must be met (i.e. sub-categories a-g).

Core Competencies include:

I. Body Plan & Organization*
   a. Anatomical position
   b. Body planes and sections
   c. Body cavities and regions
   d. Directional terms
   e. Basic terminology
   f. Levels of organization
   g. Survey of body systems

II. Homeostasis*

a. Definition
b. General Types of homeostatic mechanisms

III. Chemistry & Cell Biology (Note: This core concept is provided for A&P courses that do not have a prerequisite (or prerequisites) class which includes both chemistry and cell biology. Content covered by required prerequisite courses does not need to be repeated in Anatomy & Physiology) *

a. Atoms and molecules
b. Chemical bonding
c. Inorganic compounds and solutions
d. Organic compounds
e. Energy transfer using ATP
f. General organization of a cell
g. Cellular membrane structure and function
h. Mechanisms for movement of materials across plasma (cell) membranes
i. Membrane potential
j. Organelles
k. Protein synthesis
l. Cellular respiration (introduction)
m. Cell cycle

IV. Histology*

a. Overview of histology and tissue types
b. Microscopic anatomy, location, and functional roles of epithelial tissue
c. Microscopic anatomy, location, and functional roles of connective tissue
d. Microscopic anatomy, location, and functional roles of muscle tissue
e. Microscopic anatomy, location, and functional roles of nervous tissue
f. Membranes (mucous, serous, cutaneous, and synovial)
g. Intercellular connections (cell junctions)
h. Tissue growth, modification, and repair

V. Integumentary System*

a. General composition and functions of the integumentary system and the subcutaneous layer (hypodermis or superficial fascia)
b. Gross and microscopic anatomy of the integument and subcutaneous later (hypodermis and superficial fascia)
c. Roles of specific tissue layers of skin and the subcutaneous later (hypodermis and superficial fascia)
d. Structure and function of epidermal derivatives (accessory structures of the integument)

e. Application of homeostatic mechanisms
f. Predictions related to disruption of homeostasis

VI. Skeletal System & Articulations*

a. General functions of the skeletal system
b. Structural components – microscopic anatomy
c. Structural components – gross anatomy
d. Physiology of embryonic bone formation (ossification or osteogenesis)
e. Physiology of bone, growth, repair, and remodeling
f. Organization of the skeletal system
g. Bones of the skeleton
h. Classification, structure, and function of joints (articulations)
i. Application of homeostatic mechanisms
j. Predictions related to disruption of homeostasis

VII. Muscular System*

a. General functions of muscle tissue
b. Identification, general location, and comparative characteristics of skeletal, smooth, and cardiac muscle tissue
c. Detailed gross and microscopic anatomy of skeletal muscle
d. Physiology of skeletal muscle contraction and relaxation
e. Skeletal muscle metabolism
f. Principles and types of whole muscle contraction
g. Nomenclature of skeletal muscles
h. Location, general attachments, and actions of the major skeletal muscles
i. Groups actions of skeletal muscles
j. Lever systems
k. Smooth muscle
l. Application of homeostatic mechanisms
m. Predictions related to disruption of homeostasis

VIII. Nervous System*

a. General functions of the nervous system
b. Organization of the nervous system
c. General anatomy of the nervous system
d. Protective roles of cranial bones and vertebral column, meninges, and cerebrospinal fluid (CSF)

e. Neurons
f. Neuroglial (glial) cells
g. Neurophysiology
h. Neurotransmitters, neuromodulators, and synaptic transmission
i. Integration of neural information
j. Structural and functional organization of the brain
k. Cranial nerves
l. Structural and functional organization of the spinal cord
m. Spinal nerves
n. Reflexes and their roles in nervous system function
o. Structure and function of sensory and motor pathways
p. Autonomic nervous system (ANS)
q. Application of homeostatic mechanisms
r. Predictions related to disruption of homeostasis

IX. General & Special Senses*

a. Sensory receptors
b. Tactile receptors
c. Gross and microscopic anatomy of the eye
d. Visual pathways
e. Olfaction
f. Gustation
g. Gross and microscopic anatomy of the ear
h. Auditory pathways
i. Equilibrium
j. Application of homeostatic mechanisms
k. Predictions related to disruption of homeostasis

X. Endocrine System*

a. General functions of the endocrine system
b. Chemical classification of hormones and mechanism of hormone actions at receptors
c. Control of hormone secretion
d. Endocrine control by the hypothalamus and pituitary gland
e. Endocrine structures and their hormones

f. Local chemical messengers
g. Hormonal response to stress
h. Application of homeostatic mechanisms
i. Predictions related to disruption of homeostasis

XI. Cardiovascular System*

a. General functions of the cardiovascular system
b. Composition of blood
c. Hematopoiesis (hemopoiesis)
d. Hemostasis
e. ABO and Rh blood grouping
f. Gross and microscopic anatomy of the heart
g. Physiology of cardiac muscle contraction
h. Blood flow through heart
i. Electrical conduction system of the heart and the electrocardiogram
j. Cardiac cycle
k. Regulation of cardia output (CO), stroke volume (SV0, and heart rate (HR)
l. Anatomy and functional roles of the different types of blood vessels
m. Systemic and pulmonary circuits (circulations)
n. Fetal (prenatal) versus postnatal circulation
o. Blood pressure and its functional interrelationships with cardiac output (CO), peripheral resistance, and hemodynamics
p. Application of homeostatic mechanisms
q. Predictions related to disruption of homeostasis

XII. Lymphatic system & Immunity*

a. General functions of the lymphatic system
b. Lymph and lymphatic vessels
c. Lymphatic cells, tissues, and organs
d. Introduction to innate (nonspecific) and adaptive (specific) immune responses
e. Innate (nonspecific) defenses
f. Overview of adaptive (specific) immunity
g. Antigens and antigen processing
h. Lymphocytes and their role in adaptive (specific, acquired) immunity
i. Antibodies and their role in adaptive (specific) immunity

j. Applied immunology
k. Application of homeostatic mechanisms
l. Predictions related to disruption of homeostasis

XIII. Respiratory System*

a. General functions of the respiratory system
b. Gross and microscopic anatomy of the respiratory tract and related organs
c. Mechanisms of pulmonary ventilation
d. Pulmonary air volumes and capacities
e. Mechanisms of gas exchange in the lungs and tissues
f. Mechanisms of gas transport in the blood
g. Control of pulmonary ventilation
h. Application of homeostatic mechanisms
i. Predictions related to homeostatic imbalance

XIV. Digestive system*

a. Structure and functions of the digestive system
b. General gross and microscopic anatomy of the gastrointestinal tract
c. Peritoneum and mesenteries
d. Oral cavity
e. Anatomy of the pharynx
f. Gross and microscopic anatomy of the esophagus
g. Gross and microscopic anatomy of the stomach
h. Gross and microscopic anatomy of the small intestine
i. Gross and microscopic anatomy of the large intestine, rectum, and anal canal
j. Gross and microscopic anatomy of the accessary digestive organs
k. Motility in the gastrointestinal tract
l. Physiology of digestion
m. Processes of absorption
n. Hormonal and neural regulation of digestive processes
o. Application of homeostatic mechanisms
p. Predictions related to homeostatic imbalance

XV. Nutrients & Metabolism*

a. Nutrients

b. Introduction to metabolism
c. Cellular respiration and metabolism of carbohydrates, fats, and proteins
d. Energy balance and thermoregulation
e. Application of homeostatic mechanisms
f. Predictions related to homeostatic imbalance

XVI. Urinary System*

a. General functions of the urinary system
b. Gross and microscopic anatomy of the kidney
c. Gross and microscopic anatomy of the urinary tract (i.e., ureters, urinary bladder, urethra)
d. Functional process of urine formation, including filtration, reabsorption, and secretion
e. Control of sodium, potassium, and water homeostasis
f. Additional endocrine activities of the kidney
g. Micturition (urination)
h. Application of homeostatic mechanisms
i. Predictions related to disruption of homeostasis

XVII. Fluid/Electrolytes & Acid-Base Balance*

a. Body fluid compartments
b. Regulation of body osmolarity
c. Homeostasis of blood volume, blood pressure, and body osmolarity
d. Potassium and calcium homeostasis
e. Acid-base homeostasis and buffer systems
f. Integrated control of acid-base homeostasis

XVIII. Reproductive System*

a. Overview of the male and female reproductive systems
b. Gross and microscopic anatomy of the male reproductive system
c. Gross and microscopic anatomy of the female reproductive system
d. Spermatogenesis and spermiogenesis
e. Oogenesis, folliculogenesis, and the ovarian cycle
f. Comparison of male and female gametogenesis
g. Uterine (menstrual) cycle
h. Lifespan changes within the male and female reproductive systems
i. Fertilization and pregnancy

j. Parturition (labor)
k. Postpartum changes to the mother
l. Predictions related to disruption of the reproductive system

XIX. Introduction to Heredity

a. Genetic variability
b. Gene expression and inheritance
c. Genetic testing

XX. Embryology

a. Timeline of human development
b. Conception through week 2 (bilaminar germinal disc)
c. Embryonic period
d. Fetal period

Lab Course Learning Outcomes

Anatomy and Physiology is a lab-based science course. As such, the laboratory component is an integral part of the course, whether graded separately or in combination with a lecture component. Curriculum should focus on providing students with an active-learning environment, reflect universal education, and encompass the various levels of knowledge and mastery. Laboratory instruction should encourage students to work within a group to gain hands-on experiences. The laboratory lessons provide a practical understanding of how human anatomy structures and functions are interrelated. Dissection or prosection is considered an essential component of any human Anatomy and Physiology laboratory curriculum. Experiments demonstrating physiological function are also necessary. Students should apply scientific principles governing human Anatomy and Physiology while simultaneously developing necessary critical thinking skills required of future scientists and health professionals. Given that the laboratory is an active learning environment, direct student participation is always preferable to instructor demonstrations or activities (i.e., workbook and/or computer-generated activities) that could be done in a non-laboratory setting. The use of demonstrations, workbook, and/or computer-generated activities should be encouraged as a preparation for laboratory activities, but not in place of hands-on laboratory experiences. Additionally, the development of (or incorporation of pre-designed) laboratory activities should provide every student with a variety of opportunities for active exploration of both the anatomical and physiological concepts covered in the lecture component of the course. The coverage of concepts and topics are not expected to be equivalent within any single laboratory exercise. Yet, the totality of laboratory experiences should provide students with the ability to explore both Anatomy and Physiology to the greatest extent possible given differences in laboratory setting and equipment availability to the student and instructors.

Laboratory Modalities: All laboratory modalities will be considered and reviewed on a case-by-case basis.